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FACULTY OF ENGINEERING,  
FERDOWSI UNIVERSITY OF MASHHAD

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# Trustable Mobile Crowd Sourcing for Acquiring Information from a Flooded Smart Area



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# Authors

**Sajedah Abbasi**

**Dr. Hamed Vahdat-Nejad**

PerLAB  
University of Birjand

**Dr. Hamideh Hajiabadi**

# Introduction

- ❖ Flood is the most common natural disaster, and after a disaster occurs, relief forces work together to help people in affected areas.
- ❖ Due to the popularity of mobile phones, the crowdsourcing model has been proposed in smart cities to obtain the information needed by the rescue forces.
- ❖ One of the main challenges of crowdsourcing systems is identifying malicious users who destroy the entire data.

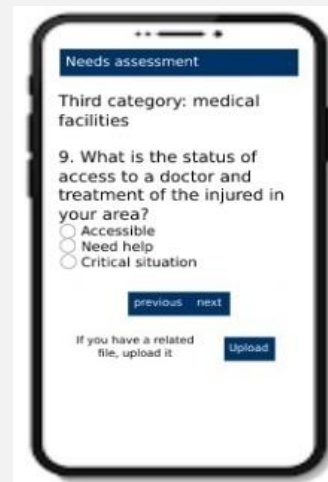
# Background

- ❖ In this regard, the MAppERS application [8] provides a platform in which users enter the water level and upload photos taken from the height of the water surface. They can also mark their requirements in the list.
- ❖ Similarly, users in another Crowdsourcing systems report flood information and their needs such as food, warm clothing, health supplies and medical care through an application [9].

# Proposed Method

❖ In order to solve these challenges, the needs of the flood-affected people should be identified as the information needs of the relief forces, this information includes the following: Victim, Facility and Livelihood, medical and transfer

❖ After acquiring and categorizing the needs, a questionnaire including 15 multiple-choice and two descriptive questions is designed.



A multiple choice question that has a file upload section.



In this question, users enter the names of the requested drugs.



Users enter additional information in this question.

# Proposed Method

- ❖ In some cases, the crowdsourcing system is exposed to inaccurate information, which is proposed to solve this problem, a malicious user detection algorithm. In this algorithm, the statistical approach is used to detect the outlier data, and then malicious users are identified and removed from the system.
- ❖ The following relationships are used to outlier data detection.

$$\bar{x} = \left(\frac{1}{N}\right) \sum_{i=1}^N x_i \quad \delta = \sqrt{\left(\frac{1}{N}\right) \sum_{i=1}^N (x_i - \bar{x})^2}$$

After calculating the mean and standard deviation of the data received in the last period for a specific region, the interval  $[\bar{x}-2\delta, \bar{x}+ 2\delta]$  is considered the valid interval for the mentioned period and region.

# Proposed Method

After determining the number of outlier data provided by a user, the type of user participation (Malicious or non-Malicious) is determined by Equation.

$$A_i = \frac{\text{Number of outlier Data Elements for user } i}{\text{Total Sent Data Elements by user } i}$$

$$\text{participation type: } \begin{cases} A_i \leq 0.5 & \text{non-Malicious User} \\ A_i > 0.5 & \text{Malicious User} \end{cases}$$

The malicious user detection algorithm is executed periodically at one-hour intervals. To reflect the minimum number of statistical instances for calculating mean and standard deviation, the malicious user detection algorithm is executed if at least five users have participated in the system in the last period.



# Results

❖ A simulator has been designed using MATLAB software to evaluate the proposed method. In this regard, five types of users are simulated. The results obtained are shown in the table below.

User	User type	Number of valid answers	Total number of questions	participation type
User1	Random	5	15	Malicious User
User2	Pattern	6	15	Malicious User
User3	Accurate	15	15	non-Malicious User
User4	Normal distribution with low variance	10	15	non-Malicious User
User5	Normal distribution with high variance	6	15	Malicious User

# Conclusion

- ❖ the information needs assessment of the data collection system from the flooded area has been performed, and the needs have been categorized.
- ❖ Then the mobile crowdsourcing system provides a questionnaire including multiple-choice and descriptive questions to the users available in the area.
- ❖ The data sent by users are then processed using the proposed malicious user detection algorithm to detect outlier data and malicious users and subsequently remove the malicious users from the system.
- ❖ The simulation results via MATLAB have revealed that the proposed scheme reasonably detects outlier data and malicious user data.

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# Thank you for your attention

ROOM C-214, FACULTY OF ENGINEERING, FERDOWSI UNIVERSITY OF MASHHAD  
MASHHAD, IRAN

TEL: 051 3880 6133 | FAX: 051 3880 7151

 [WWW.SCIOT2022.UM.AC.IR](http://WWW.SCIOT2022.UM.AC.IR)

 [SCIOT2022@UM.AC.IR](mailto:SCIOT2022@UM.AC.IR)

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